

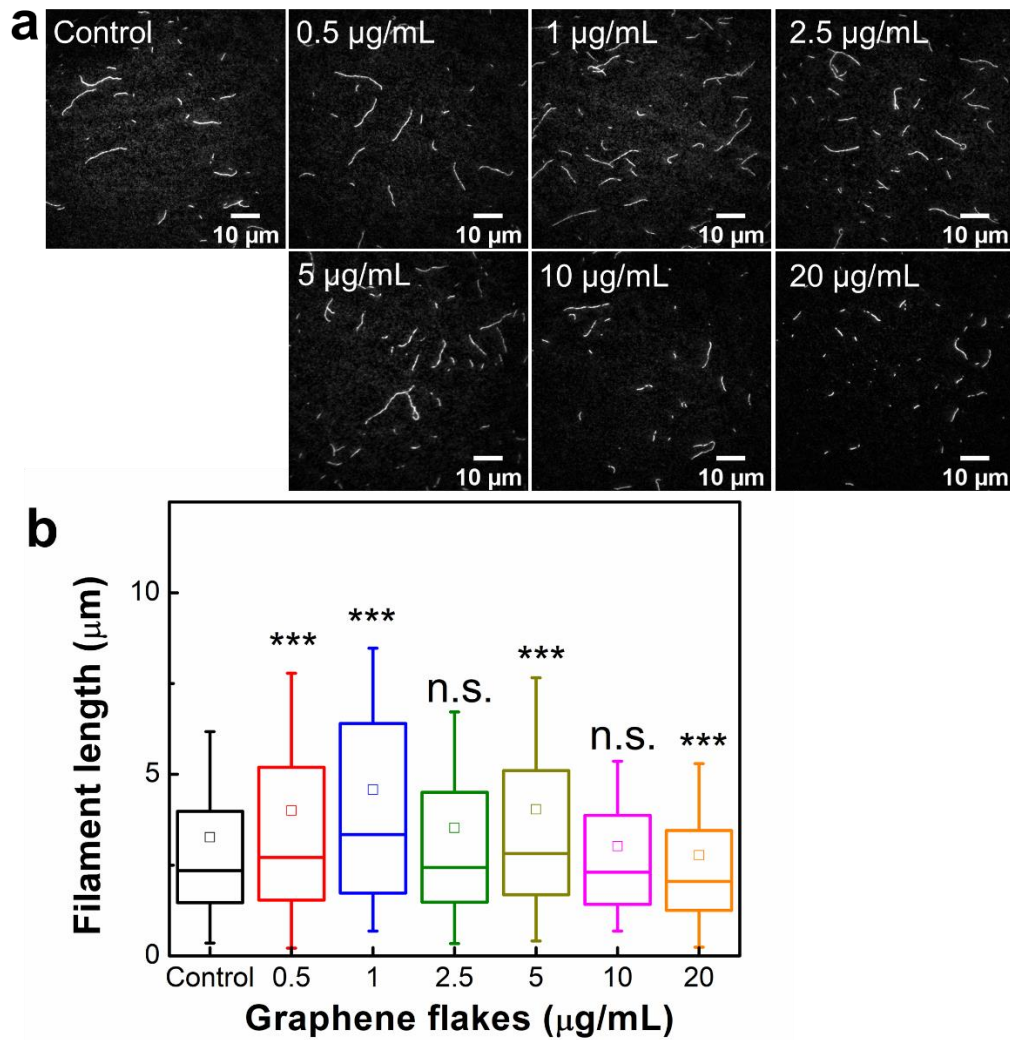
## Supplementary Information

### **Graphene enhances actin filament assembly kinetics and modulates NIH-3T3 fibroblast cell spreading**

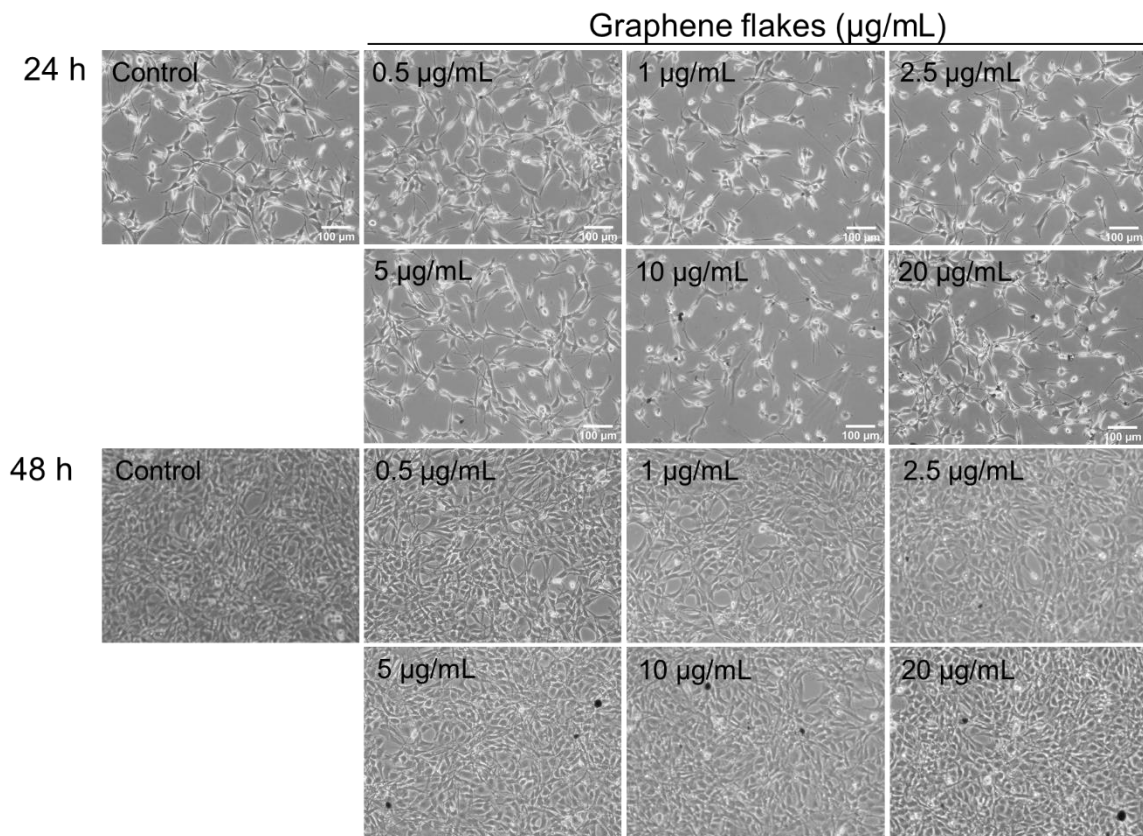
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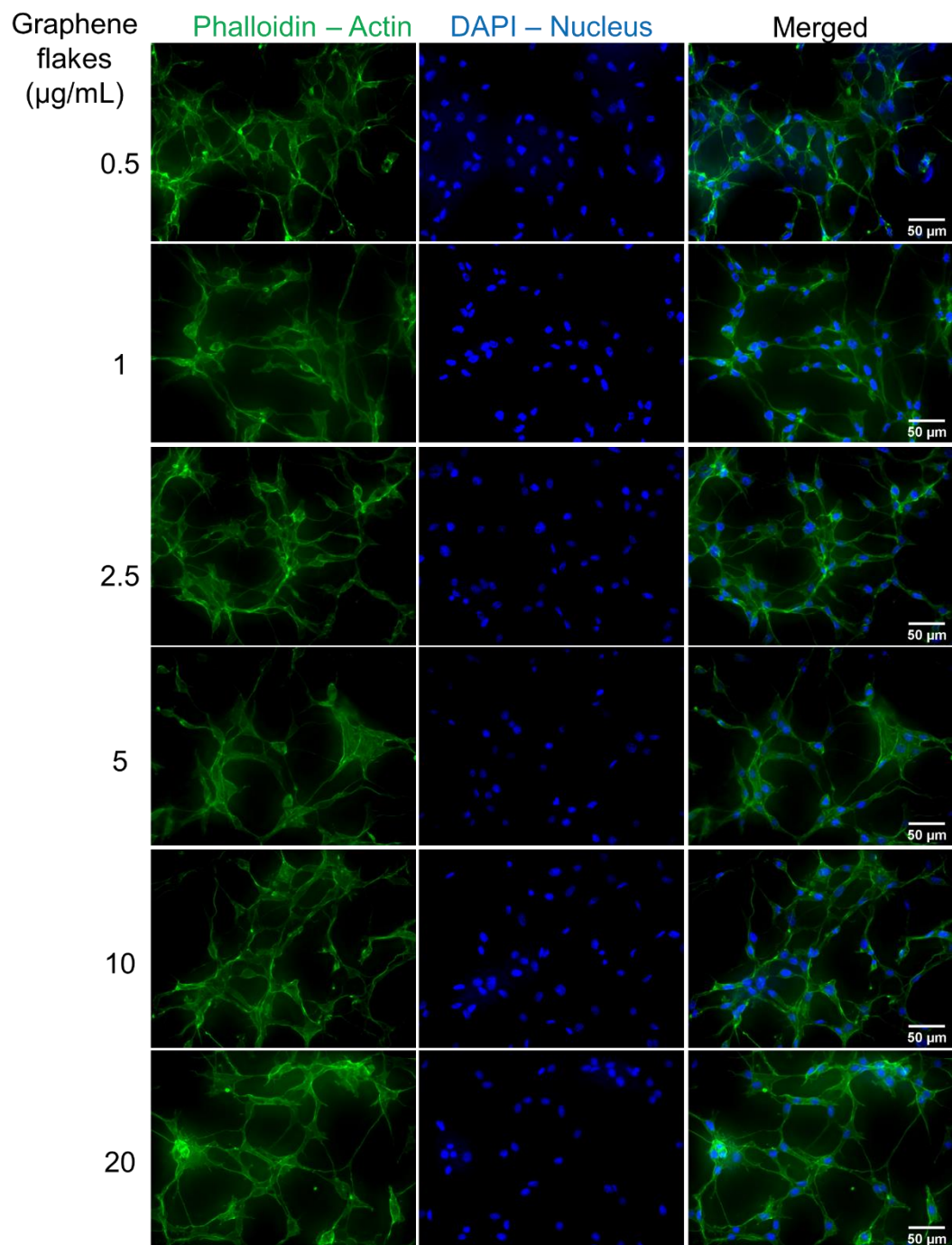
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**Fig. S1 Graphene flakes modulate steady-state actin filament lengths.** (a) Representative TIRF microscopy images of actin filaments (1  $\mu\text{M}$ , Alexa-labeled) in the absence (control) or presence of varying concentrations of graphene flakes (0.5-20  $\mu\text{g/mL}$ ) in polymerization buffer (50 mM KCl, 2 mM  $\text{MgCl}_2$ , 10 mM Imidazole, pH 7.0, 1 mM ATP, 1 mM DTT). (Scale bars, 10  $\mu\text{m}$ ). (b) Average steady-state actin filament lengths with varying concentrations of graphene flakes. The box represents the 25-75<sup>th</sup> percentile, whiskers indicate standard deviation (SD), and the middle square is the mean. Statistical analysis was performed using Tukey's test.  $N=979-1669$ , n.s.; not significant, \*\*\*,  $p<0.001$ .



**Fig. S2 Optical microscopy images of NIH-3T3 cells with graphene flakes.** The bright field images of cells in the absence (control) or presence of varying concentrations (0.5-20  $\mu\text{g/mL}$ ) of graphene flakes were taken after 24 h and 48 h of the treatment (Scale bars, 100  $\mu\text{m}$ ). Cells were incubated up to 48 h on a poly-L-lysine coated coverslip and treated with graphene flakes, followed by staining with Alexa-488 phalloidin (actin, green) and DAPI (nucleus, blue).



**Fig.S3 Effect of graphene flakes on NIH-3T3 cell morphology.** Representative confocal microscopy images of NIH-3T3 cells in the presence of graphene flakes (Scale bars, 50  $\mu\text{m}$ ). Graphene flakes (0.5-20  $\mu\text{g/mL}$ ) have insignificant impact on NIH-3T3 cell morphology. Cells were incubated for 24 h on poly-L-lysine coated coverslips and treated with graphene flakes, followed by staining with Acti-stain 488 phalloidin (actin, green) and DAPI (nucleus, blue).